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THESIS TITLE

BY

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DISSERTATION

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Doctoral Committee:

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Abstract

Write abstract here.

Write Dedication Here

Acknowledgments

Write your acknowledgements here

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List of Abbreviations

ATLAS	A Toroidal LHC ApparatuS.
CERN	European Organization for Nuclear Research.
LHC	Large Hadron Collider.

List of Symbols

ℓ lepton.

θ polar angle.

Preface

The following is a summary of useful concepts in high energy particle physics.

0.1 Units

Discussion of units

0.2 Coordinates

LHC coordinate systems

0.3 Statistics

Statistics in particle physics

Chapter 1

Introduction

This is the first chapter of the dissertation. [1]

1.1 Creating Figures

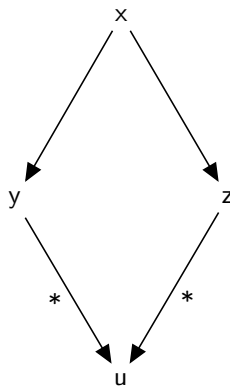


Figure 1.1: This is a placeholder figure to act as an example. Here we cite a new reference in the caption to demonstrate that given the package configuration our order of references will not be distributed by the table of contents [2].

As can be seen in Figure 1.2, the subfigures are independent of each other such that Figure 1.2a and Figure 1.2b can be accessed separately.

As an example of an equation formatted in “display style” the equation for the fiducial cross section from [3] is reproduced as Equation 1.1:

$$\sigma_{\text{inel}}^{\text{fid}}(\zeta > 10^{-6}) = \frac{N - N_{\text{BG}}}{\epsilon_{\text{trig}} \times \mathcal{L}} \times \frac{1 - f_{\zeta < 10^{-6}}}{\epsilon_{\text{sel}}} \quad (1.1)$$

1.2 Creating Tables

To create tables in \LaTeX it is highly recommended to use the `booktabs` package. It allows for very elegant and clean table creation, such as Table 1.1. If you want to create a table quickly, or have a CSV file that



(a) This is the first figure of two, in this example, and its own independent subfigure. (b) As the `t` alignment option was chosen for the subfigures, they are still properly aligned vertically even though this caption is longer.

Figure 1.2: An example of a figure that consists of two subfigures.

you'd like to quickly turn into a table there are various online L^AT_EX table generators.

Table 1.1: Common quantities in particle physics given in both natural units and SI units.

Quantity	Natural Units	Natural Units (dimensionful)	SI Units
Speed	1	c	3.0×10^8 m/s
Angular Momentum	1	\hbar	10^{34} m ² kg/s
Energy	GeV	GeV	1.6×10^{-10} J
Momentum	GeV	GeV/ c	1×10^{-19} kg m/s
Mass	GeV	GeV/ c^2	1.8×10^{-27} kg
Time	1/GeV	\hbar /GeV	6.6^{-25} s
Length	1/GeV	$\hbar c$ /GeV	2×10^{-16} m
Electric Charge	1	$e/\sqrt{4\pi\alpha_{em}}$	5.3×10^{-19} C
Magnetic Field	(GeV) ²	(GeV) ² / $\hbar c^2$	5×10^{16} T

Good table design requires some thought and work, so it may be worth a look through some examples:

- TeX StackExchange: Tip on how to make a visually good table
- Edward Tufte endorsed example from Darkhorse Analytics

1.3 Dealing with Widows and Orphans

To reduce the difficulty of dealing with widowed text (the last line of a paragraph at the start of a page) and orphaned text (the first line of paragraph at the end of a page) the `nowidow` package is used. However, that doesn't solve the issue of orphaned section titles. The user must manually do this, but the following simple advice from T_EX FAQ is recommended:

Once you've exhausted the automatic measures, and have a final draft you want to "polish", you should proceed to manual measures. To get rid of an orphan is simple: precede the paragraph

with `\clearpage` and the paragraph can't start in the wrong place.

Appendix A

An Appendix

Appendix text goes here.

References

- [1] ATLAS Collaboration, *The ATLAS Experiment at the CERN Large Hadron Collider*, *JINST* **3** (2008) S08003. 2
- [2] P. W. Higgs, *Broken symmetries, massless particles and gauge fields*, *Phys. Lett.* **12** (1964) 132–133. vii, 2
- [3] ATLAS Collaboration, *Measurement of the Inelastic Proton–Proton Cross Section at $\sqrt{s} = 13$ TeV with the ATLAS Detector at the LHC*, *Phys. Rev. Lett.* **117** (2016) 182002, [1606.02625]. 2